Transportable Device for Transference of Atmosphere Sensitive Materials from Glove Box to High Resolution Scanning Electron Microscope

Bentzen, Janet Jonna; Wichmann, Mike; Blanchard, Didier

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Transportable Device for Transference of Atmosphere Sensitive Materials from Glove Box to High Resolution Scanning Electron Microscope

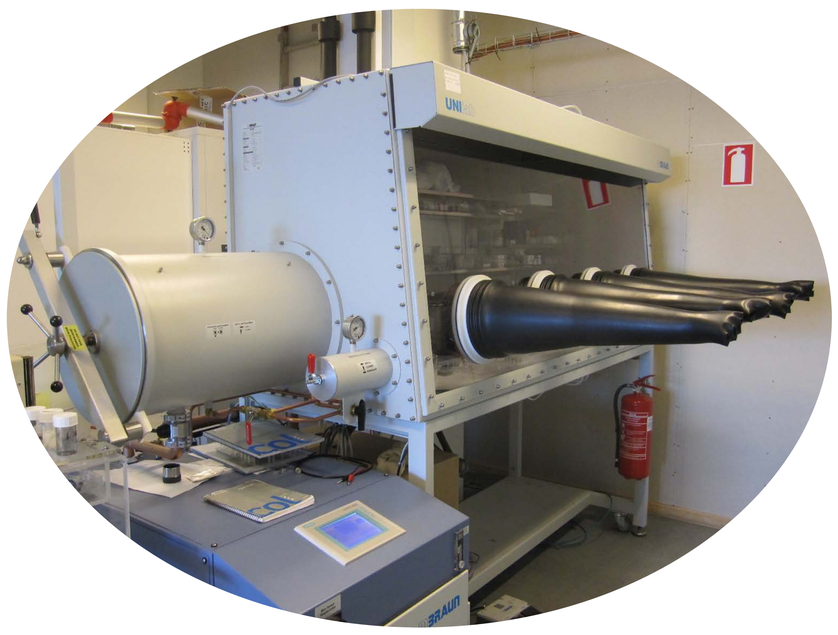
Janet J. Bentzen, Mike Wichmann, and Didier Blanchard

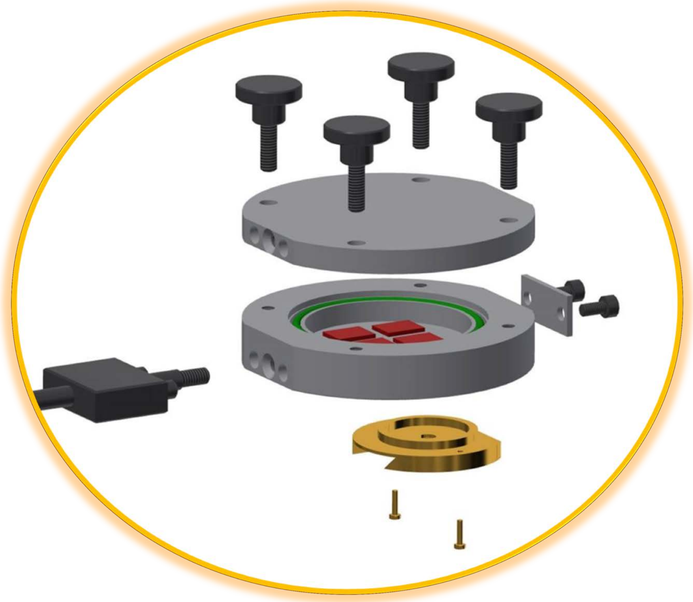
Department of Energy Conversion and Storage, Technical University of Denmark, DK-4000 Roskilde, Denmark

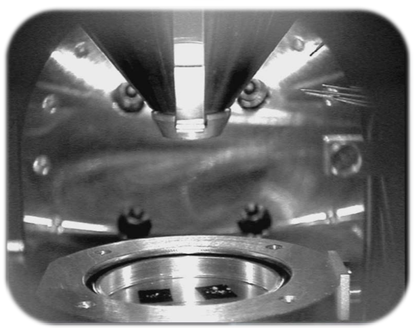
Introduction

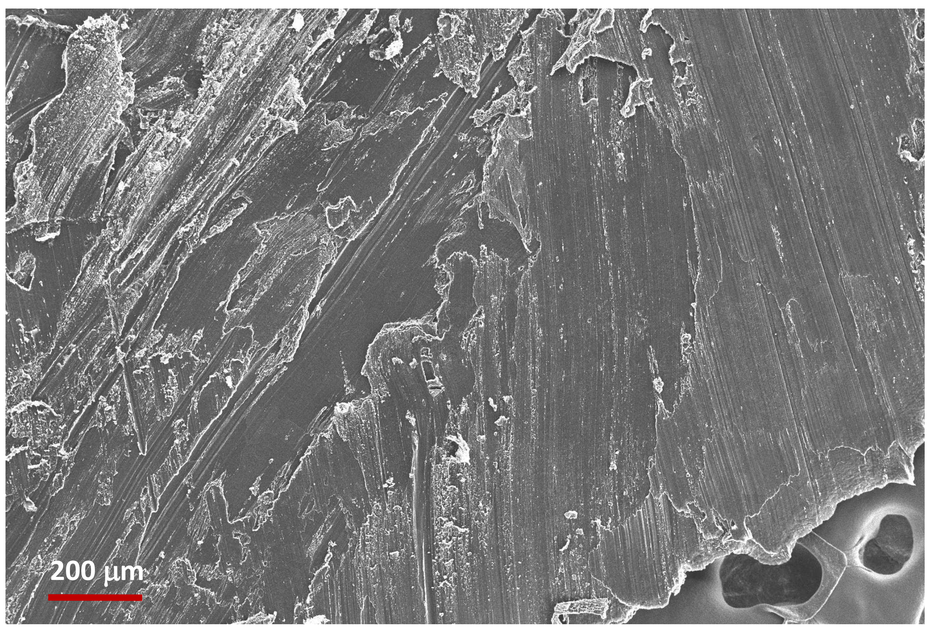
Moisture or air sensitive materials are often encountered in fields such as battery, pharmaceutical, or catalyst R&D. Study of their microstructures, which determine their functionalities, is of primary importance. It often implies the use of electron microscopy but the transfer to the microscope chamber usually results in exposure to the surrounding atmosphere therefore modifying the materials. For example, research on high energy battery involves highly reactive materials based on lithium. To study their degradation in aged batteries, High Resolution Scanning Electron Microscopy (HRSEM) is a valuable technique, and to protect these sensitive materials during their transport, from the protective atmosphere of the glove box to the HRSEM sample chamber, we have constructed an air tight transportable device. The device holds a specimen chamber that is 40 mm in diameter and 5 mm in height and it is constructed from aluminum. This transfer device is usable in connection with instruments such as Zeiss Merlin and Zeiss 1540 XB.

The successful use of the transfer device is illustrated by the imaging performed on high energy battery materials.

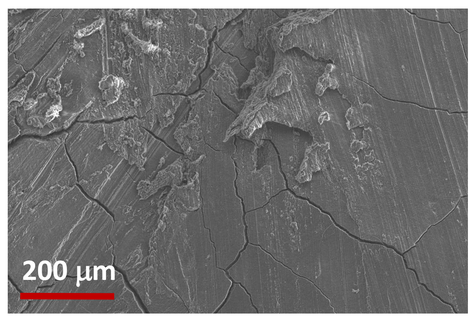




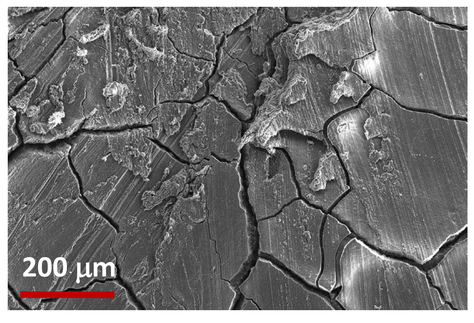




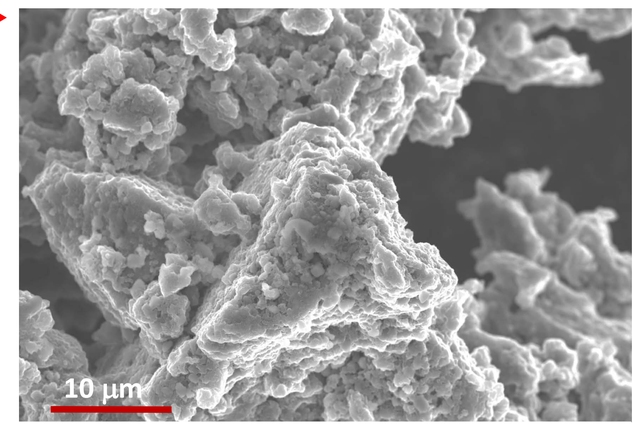
Pure lithium stored under Ar in a glove box, scraped on part of the surface to ensure the existence of a fresh metal surface transferred to the HRSEM applying the air tight transfer device. (Secondary electron image)



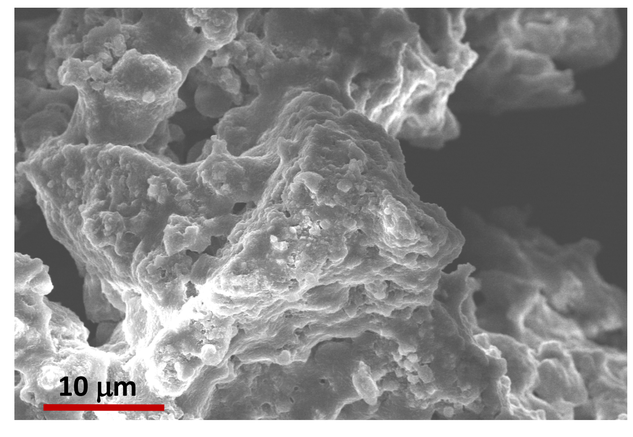
Same Li surface after 15 h exposure to air. (Secondary electron image)



Same Li surface after 17 days of exposure to air. (Secondary electron image)



$LiBH_4$+SiO_2 mixture (electrolyte in Li-S solid state batteries) as prepared under Ar in a glove box, transferred applying the air tight transfer device. (InLens Secondary electron image)



$LiBH_4$+SiO_2 mixture after 17 days of exposure to air. (InLens Secondary electron image)

DTU Energy
Department of Energy Conversion and Storage

* Corresponding author: Janet J. Bentzen, jabe@dtu.dk